

EXHIBIT 7

Reference Guide on Estimation of Economic Losses in Damages Awards

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I. Introduction

This reference guide identifies areas of dispute that arise frequently when economic losses are at stake. Even though such evidence differs from other topics presented in this manual, it is included because expert testimony is commonly offered on these issues. This reference guide discusses the application of economic analysis within the established legal framework for damages. It is not a commentary on the legal framework. It does not lay out a comprehensive theory of damages measurement, nor does it describe the applicable law. We give only a few legal citations where courts have introduced economic principles into damages.

This reference guide has three major sections. Section II discusses the qualifications required of experts who quantify damages. Section III considers issues common to most studies of economic damages (the harmful event, pretrial earnings and mitigation, prejudgment interest, future earnings and losses, subsequent events, and apportionment). Section IV considers the major subject areas of economic loss measurement (personal lost earnings, intellectual property losses, antitrust losses, securities losses, and liquidated damages).

Our discussion follows the structure of the standard damages study, as shown in Figure 1. We assume that the defendant has been found liable for damages for a harmful event he or she committed sometime in the past. The plaintiff is entitled to recover monetary damages for losses occurring before and possibly after the time of the trial. The top line of Figure 1 measures the losses before trial; the bottom line measures the losses after trial.¹

The defendant's harmful act has reduced the plaintiff's *earnings*, or stream of economic value. Earnings are the stream of economic value received in the form of compensation by a worker, the profit earned by a business, or one-time receipts, such as the proceeds from the sale of property. They are measured net of any associated costs.

The essential features of a study of losses are the quantification of the reduction in earnings, the calculation of interest on past losses, and the application of financial *discounting* to future losses. The losses are measured as the difference

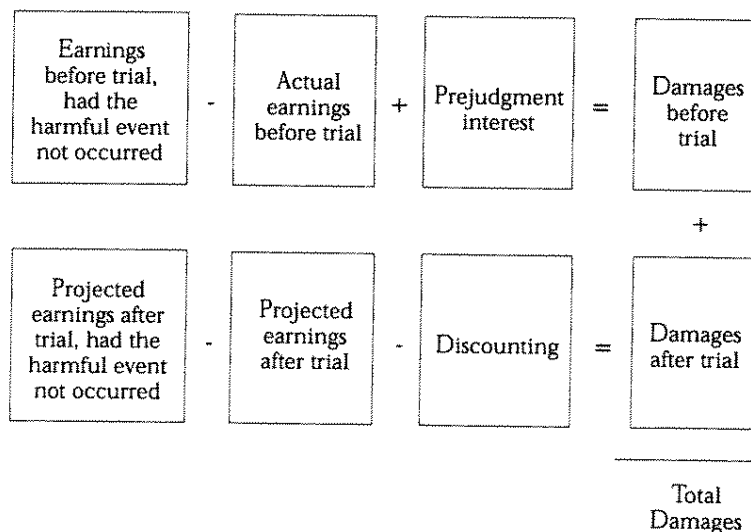
1. Our scope here is limited to losses of actual dollar income. However, economists have a growing role in the measurement of non-dollar damages, including pain and suffering and the hedonic value of life. See generally W. Kip Viscusi, *Reforming Products Liability* (1991).

between the earnings the plaintiff would have received if the harmful event had not occurred and the earnings the plaintiff has or will receive, given the harmful event. The plaintiff may be entitled to interest for losses occurring before the trial. Losses occurring after trial will normally be discounted. The majority of damages studies fit this format, so we have used it as the basic organization of this reference guide.²

We use numerous brief examples to explain the disputes that can arise. These examples are not full case descriptions; they are deliberately stylized. They attempt to capture the types of disagreements about damages that arise in practical experience, though they are purely hypothetical. In many examples, the dispute involves factual as well as legal issues. We do not try to resolve the disputes in these examples. We hope that the examples will help clarify the legal and factual disputes that need to be resolved before or at trial.

Each area of potential dispute is introduced with a question. It is our hope that the majority of disputes over economic damages can be identified by asking each of these questions to the parties. Of course, some questions, especially in section IV, are only relevant in their specific subject areas. Most of the questions in section III, however, should help sort out areas of contention that may well arise in any dispute involving economic losses.

Figure 1
Standard Format for a Damages Study



2. In the Appendix, we give an example of a complete damages study in the spreadsheet format often presented by damages experts. Readers who prefer learning from an example may want to read the Appendix before the body of this reference guide.

II. Expert's Qualifications

Experts who quantify damages come from a variety of backgrounds. Whatever his or her background, however, a damages expert should be trained and experienced in quantitative analysis. For economists, the standard qualification is the Ph.D. Damages experts with business or accounting backgrounds often have MBA degrees or CPA credentials, or both. The specific areas of specialization needed by the expert are dictated by the method used and the substance of the damages claim. In some cases, participation in original research and the authorship of professional publications may add to the qualifications of an expert. The relevant research and publications are less likely to be in damages measurement per se than in topics and methods encountered in damages analysis. For example, a damages expert may need to restate prices and quantities in a market with more sellers than are actually present. Direct participation in research on the relation between market structure and performance would be helpful for an expert undertaking that task.

Statistical *regression analysis* is sometimes used to make inferences in damages studies.³ Specific training is required to apply regression analysis. As another example, damages studies may involve statistical surveys of customers.⁴ In this case, the damages expert should be trained in survey methods or should work in collaboration with a qualified survey statistician. Because damages estimation often makes use of accounting records, most damages experts need to be able to interpret materials prepared by professional accountants. Some damages issues may require assistance from a professional accountant.

Experts benefit from professional training and experience in areas relevant to the substance of the damages claim. For example, in the case of lost earnings, an expert will benefit from training in labor economics; in intellectual property and antitrust, a background in industrial organization will be helpful; and in securities damages, a background in finance will assist the expert.

3. For a discussion of regression analysis, see generally Daniel L. Rubinfeld, Reference Guide on Multiple Regression, in this manual.

4. For a discussion of survey methods, see generally Shari Seidman Diamond, Reference Guide on Survey Research, in this manual.

III. Issues Common to Most Damages Studies

Throughout our discussion, we assume that the plaintiff is entitled to compensation for losses sustained from a harmful act of the defendant. The harmful act may be an act whose occurrence itself is wrongful, as in a tort, or it may be a failure to fulfill a promise, as in a breach. In the first instance, damages are generally calculated under the principle that compensation should place the plaintiff in a position economically equivalent to the plaintiff's position absent the harmful event. In applications of this principle, either *restitution damages* or *reliance damages* are calculated. These two terms are essentially synonyms with respect to their economic content. The term restitution is used when the harmful act is an injury or theft, and reliance is used when the harmful act is fraud. In the second instance, breach of a contract or duty, damages are generally calculated under the expectation principle, where the compensation is intended to replace what the plaintiff would have gotten if the promise or bargain had been fulfilled. These types of damages are called *expectations damages*.

In this section, we review the elements of the standard loss measurement in the format of Figure 1. For each element, there are several areas of potential dispute. The sequence of questions posed in section III should identify most if not all of the areas of disagreement between the damages analyses of opposing parties.

A. Characterization of the Harmful Event

1. How was the plaintiff harmed and what legal principles govern compensation for the harm?

The first step in a damages study is the translation of the legal theory of the harmful event into an analysis of the economic impact of that event. In most cases, the analysis considers the difference between the plaintiff's economic position if the harmful event had not occurred and the plaintiff's actual economic position. The damages study restates the plaintiff's position "but for" the harmful event; this part is often called the *but-for analysis*. Damages are the difference between the but-for value and the actual value.

In cases where damages are calculated under the restitution-reliance principle, the but-for analysis posits that the harmful event did not occur. In many cases—such as injuries resulting from accidents—the but-for analysis presumes

no contact at all between the parties. Damages are the difference between the value the plaintiff would have received had there been no contact with the defendant and the value actually received. When the harmful event is misrepresentation by the defendant, resulting in an economically detrimental relationship between the defendant and the plaintiff, the but-for analysis will again consider the value the plaintiff would have received in the absence of that relationship. Typically, the but-for analysis for fraud will adopt the premise that the plaintiff would have entered into a valuable relationship with an entity other than the defendant. For example, if the defendant's misrepresentations have caused the plaintiff to purchase property unsuited to the plaintiff's planned use, the but-for analysis might consider the value that the plaintiff would have received by purchasing a suitable property from another seller.

Expectations damages generally arise from the breach of a contract or duty. The harmful event is the defendant's failure to perform. Damages are the difference between the value the plaintiff would have received had the defendant performed its obligations and the value the plaintiff actually obtained.

Although the characterization of the harmful event begins with a clear statement of the harmful event and its effect on the plaintiff, that alone is not sufficient. It must also include:

- a statement about the economic situation absent the wrongdoing;
- a characterization of the causal link between the wrongdoing and the harm the plaintiff suffered; and
- a description of the defendant's proper behavior.

In addition, the characterization will resolve such questions as whether to measure damages before or after taxes and the appropriate measure of costs. Many conflicts between the damages experts for the plaintiff and the defendant arise from different characterizations of the harmful event and its effects.

A comparison of the parties' statements about the harmful event and what would have happened in its absence will reveal differences in legal theories that result in potentially large differences in damages.

Example: Client is the victim of unsuitable investment advice by Broker (all of Client's investments made by Broker are the result of Broker's negligence). Client's damages study measures the sum of the losses of the investments made by Broker, including only the investments that incurred losses. Broker's damages study measures the net loss by including an offset for those investments that achieved gains.

Comment : Client is considering the harmful event to be the recommendation of investments that resulted in losses, whereas Broker is considering the harmful event to be the entire body of investment advice. Under Client's theory, Client

would not have made the unsuccessful investments but would have made the successful ones, absent the unsuitable advice. Under Broker's theory, Client would not have made any investments based on Broker's advice.

A clear statement about the plaintiff's situation but for the harmful event is also helpful in avoiding double counting that can arise if a damages study confuses or combines reliance and expectations damages.

Example: Marketer is the victim of defective products made by Manufacturer; Marketer's business fails as a result. Marketer's damages study adds together the out-of-pocket costs of creating the business in the first place and the projected profits of the business had there been no defects. Manufacturer's damages study measures the difference between the profit margin Marketer would have made absent the defects and the profit margin he actually made.

Comment: Marketer has mistakenly added together damages from the reliance principle and the expectations principle. Under the reliance principle, Marketer is entitled to be put back to where he would have been had he not started the business in the first place. Damages are his total outlays less the revenue he actually received. Under the expectations principle, applied in Manufacturer's damages study, Marketer is entitled to the profit on the extra sales he would have received had there been no product defects. Out-of-pocket expenses of starting the business would have no effect on expectations damages because they would be present in both the actual and the but-for cases, and would offset each other in the comparison of actual and but-for value.

2. Are the parties disputing differences in the plaintiff's economic environment absent the harmful event?

The analysis of some types of harmful events requires consideration of effects, such as *price erosion*, that involve changes in the economic environment caused by the harmful event. For a business, the main elements of the economic environment that may be affected by the harmful event are the prices charged by rivals, the demand facing the seller, and the prices of inputs. Misappropriation of intellectual property might enable rivals to set lower prices because of their royalty-free use of the technology, for example. In contrast, some harmful events do not change the plaintiff's economic environment. For example, the theft of some of the plaintiff's products would not change the market price of those products, nor would an injury to a worker change the general level of wages in

the labor market. A damages study need not analyze changes in broader markets when the harmful act plainly has minuscule effects in those markets.

For example, the plaintiff may assert that, absent the defendant's wrongdoing, a higher price could have been charged; the defendant's harmful act has eroded the market price. The defendant may reply that the higher price would lower the quantity sold. The parties may then dispute by how much the quantity would fall as a result of higher prices.

Example: Valve Maker infringes patent of Rival. Rival calculates lost profits as the profits actually made by Valve Maker plus a price-erosion effect. The amount of price erosion is the difference between the higher price that Rival would have been able to charge absent Valve Maker's presence in the market and the actual price. The price-erosion effect is the price difference multiplied by the combined sales volume of the Valve Maker and Rival. Defendant Valve Maker counters that the volume would have been lower had the price been higher. Defendant measures damages taking account of lower volume.

Comment: Wrongful competition is likely to cause some price erosion and, correspondingly, some enlargement of the total market because of the lower price. The actual magnitude of the price-erosion effect could be determined by economic analysis.

We consider price erosion in more detail in section IV.B, in connection with intellectual property damages. However, price erosion may be an issue in many other commercial disputes. For example, a plaintiff may argue that the disparagement of its product in false advertising has eroded its price.

In more complicated situations, the damages analysis may need to focus on how an entire industry would be affected by the defendant's wrongdoing. For example, one federal appeals court held that a damages analysis for exclusionary conduct must consider that other firms beside the plaintiff would have enjoyed the benefits of the absence of that conduct, so prices would have been lower and the plaintiff's profits correspondingly less than those posited in the plaintiff's damages analysis.⁵

Example: Photographic Film Maker has used unlawful means to exclude rival film manufacturers. Rival calculates damages on the assumption that it would have been the only additional seller in the market absent the exclusionary conduct, and that Rival would have been able to sell its film at the same

5. See *Dolphin Tours, Inc. v. Pacifico Creative Servs., Inc.*, 773 F.2d 1506, 1512 (9th Cir. 1985).

price actually charged by Film Maker. Film Maker counters that other sellers would have entered the market and driven the price down, so Rival has overstated damages.

Comment: Increased competition lowers price in all but the most unusual situation. Again, determination of the number of entrants attracted by the elimination of exclusionary conduct and their effect on the price probably requires a full economic analysis.

3. Is there disagreement about the causal effect of the injury?

The plaintiff might argue that the injury has dramatically reduced earnings for many years. The defendant might reply that most of the reduction in earnings that occurred up to the time of trial is the result of influences other than the injury and that the effects of the injury will disappear completely soon after the trial.

Example: Worker is the victim of a disease caused either by exposure to xerxium or by smoking. Worker sues employer, Xerxium Mine, and calculates damages as all lost wages. Defendant Xerxium Mine, in contrast, attributes most of the losses to smoking and calculates damages as only a fraction of lost wages.

Comment: The resolution of this dispute will turn on the legal question of comparative or contributory fault. If the law permits the division of damages into parts attributable to exposure to xerxium and to smoking, then medical evidence on the likelihood of cause may be needed to make that division.

Example: Real Estate Agent is wrongfully denied affiliation with Broker. Plaintiff Agent's damages study projects past earnings into the future at the rate of growth of the previous three years. Broker's study projects that earnings would have declined even without the breach because the real estate market has turned downward.

Comment : The difference between a damages study based on extrapolation from the past, here used by Agent, and a study based on actual data after the harmful act, here used by Broker, is one of the most common sources of disagreement in damages. This is a factual dispute that hinges on the relationship between real estate market conditions and the earnings of agents.

Frequently, the defendant will calculate damages on the premise that the harmful act had little, if any, causal relationship to the plaintiff's losses.

Example: Defendants conspired to rig bids in a construction deal. Plaintiff seeks damages for subsequent higher prices. Defendants' damages calculation is zero because they assert that the only effect of the bid rigging was to determine the winner of the contract and that prices were not affected.

Comment: This is a factual dispute about how much effect bid rigging has on the ultimate price. The analysis must go beyond the mechanics of the bid-rigging system to consider how the bids would be different had there been no collaboration among the bidders.

The defendant may also argue that the plaintiff has overstated the scope of the injury. Here the legal character of the harmful act may be critical; the law may limit the scope to proximate effects if the harmful act was negligence, but require a broader scope if the harmful act was intentional.

Example: Plaintiff Drugstore Network experiences losses because defendant Superstore priced its products predatorily. Drugstore Network reduced prices in all its stores because it has a policy of uniform national pricing. Drugstore Network's damages study considers the entire effect of national price cuts on profits. Defendant Superstore argues that Network lowered prices only on the West Coast and its price reductions elsewhere should not be included in damages.

Comment: It is a factual question whether adherence to a policy of national pricing is the reasonable response to predatory pricing in only part of the market.

4. Is there disagreement about alternative nonharmful conduct of the defendant in projecting the plaintiff's earnings but for the harmful event?

One party's damages analysis may hypothesize the absence of any act of the defendant that influenced the plaintiff, whereas the other's damages analysis may hypothesize an alternative, legal act. This type of disagreement is particularly common in antitrust and intellectual property disputes. Although, generally, disagreement over the alternative scenario in a damages study is a legal question, opposing experts may have been given different legal guidance and therefore made different economic assumptions, resulting in major differences in their damages estimates.

Example: Defendant Copier Service's long-term contracts with customers are found to be unlawful because they create a barrier to entry that maintains Copier Service's monopoly power. Rival's damages study hypothesizes no contracts between Copier Service and its customers, so Rival would face no contractual barrier to bidding those customers away from Copier Service. Copier Service's damages study hypothesizes medium-term contracts with its customers and argues that these would not have been found to be unlawful. Under Copier Service's assumption, Rival would have been much less successful in bidding away Copier Service's customers, and damages are correspondingly lower.

Comment: Assessment of damages will depend greatly on the substantive law governing the injury. The proper characterization of Copier Service's permissible conduct involves a mixture of legal and economic issues.

5. Are losses measured before or after the plaintiff's income taxes?

A damages award compensates the plaintiff for lost economic value. In principle, the calculation of compensation should measure the plaintiff's loss after taxes and then calculate the magnitude of pretax award needed to compensate the plaintiff fully, once taxation of the award is considered. In practice, the tax rates applied to the original loss and to the compensation are frequently the same. When the rates are the same, the two tax adjustments are a wash. In that case, the appropriate pretax compensation is simply the pretax loss, and the damages calculation may be simplified by the omission of tax considerations.⁶

In some damages analyses, explicit consideration of taxes is essential, and disagreements between the parties may arise about these tax issues. If the plaintiff's lost income would have been taxed as a capital gain, at a preferential rate, but the damages award will be taxed as ordinary income, the plaintiff can be expected to include an explicit calculation of the extra compensation needed to make up for the loss of the tax advantage. Sometimes tax considerations are paramount in damages calculations.

Example: Trustee wrongfully sells Beneficiary's property, at full market value. Beneficiary would have owned the property until death and avoided all capital gains tax.

Comment: Damages are the amount of the capital gains tax, even though the property fetched its full value upon sale.

6. There is a separate issue about the effect of taxes on the interest rate for prejudgment interest and discounting. See discussion *infra* §§ III.C, III.E.

In some cases, the law requires different tax treatment of loss and compensatory award. Again, the tax adjustments do not offset each other and consideration of taxes may be a source of dispute.

Example: Driver injures Victim in a truck accident. A state law provides that awards for personal injury are not taxable, even though the income lost as a result of the injury is taxable. Victim calculates damages as lost pretax earnings, but Driver calculates damages as lost earnings after tax. Driver argues that the nontaxable award would exceed actual economic loss if it were not adjusted for the taxation of the lost income.

Comment: Under the principle that damages are to restore the plaintiff to the economic equivalent of the plaintiff's position absent the harmful act, it may be recognized that the income to be replaced by the award would have been taxed. However, case law in a particular jurisdiction may not allow a jury instruction on the taxability of an award.

Example: Worker is wrongfully deprived of tax-free fringe benefits by Employer. Under applicable law, the award is taxable. Worker's damages estimate includes a factor so that the amount of the award, after tax, is sufficient to replace the lost tax-free value.

Comment: Again, to achieve the goal of restoring plaintiff to a position economically equivalent absent the harmful act, an adjustment of this type is appropriate. The adjustment is often called "grossing up" damages. To accomplish grossing up, divide the lost tax-free value by one minus the tax rate. For example, if the loss is \$100,000 of tax-free income, and the income tax rate is 25%, the award should be \$100,000 divided by 0.75, or \$133,333.

6. Is there disagreement about the costs that the plaintiff would have incurred but for the harmful event?

Where the injury takes the form of lost volume of sales, the plaintiff's lost value is the lost *present value* of profit. Lost profit is lost revenue less the costs avoided by selling a lower volume. Calculation of these costs is a common area of disagreement about damages.

Conceptually, *avoided cost* is the difference between the cost that would have been incurred at the higher volume of sales but for the harmful event and the cost actually incurred at the lower volume of sales achieved. In the format of

Figure 1, the avoided-cost calculation is done each year. The following are some of the issues that arise in calculating avoided cost:

- For a firm operating at capacity, expansion of sales is cheaper in the longer run than in the short run; whereas, if there is unused capacity, expansion may be cheaper in the short run.
- The costs that can be avoided if sales fall abruptly are smaller in the short run than in the longer run.
- Avoided costs may include marketing, selling, and administrative costs as well as the cost of manufacturing.
- Some costs are fixed, at least in the shorter run, and are not avoided as a result of the reduced volume of sales caused by the harmful act.

Sometimes it is useful to put cost into just two categories, that which varies in proportion to sales (*variable cost*) and that which does not vary with sales (*fixed cost*). This breakdown is rough, however, and does not do justice to important aspects of avoided costs. In particular, costs that are fixed in the short run may be variable in the longer run. Disputes frequently arise over whether particular costs are fixed or variable. One side may argue that most costs are fixed and were not avoided by losing sales volume, while the other side will argue that many costs are variable.

Certain accounting concepts are related to the calculation of avoided cost. Profit and loss statements frequently report the "cost of goods sold." Costs in this category are frequently, but not uniformly, avoided when sales volume falls. But costs in other categories, called "operating costs" or "overhead costs," also may be avoided, especially in the longer run. One approach to the measurement of avoided cost is based on an examination of all of a firm's cost categories. The expert determines how much of each category of cost is avoided.

An alternative approach uses regression analysis or other statistical methods to determine how costs vary with sales as a general matter within the firm or across similar firms. The results of such an analysis can be used to measure the costs avoided by the decline in sales volume caused by the harmful act.

7. Is there a dispute about the costs of stock options?

In some firms, employee stock options are a significant part of total compensation. The parties may dispute whether the value of options should be included in the costs avoided by the plaintiff as a result of lost sales volume. The defendant might argue that stock options should be included, because their issuance is costly to the existing shareholders. The defendant might place a value on newly issued options and amortize this value over the period from issuance to vesting. The plaintiff, in contrast, might exclude options costs on the grounds that the options cost the firm nothing, even though they impose costs on the firm's shareholders.

B. Mitigation and Earnings Before Trial

We use the term earnings for almost any dollar receipts that a plaintiff should have received. Earnings could include:

- wages, salary, commissions, bonuses, or other compensation;
- profits of a business;
- cash flow;
- royalties;
- proceeds from sales of property; and
- purchases and sales of securities.

Note that earnings in some of these categories, such as cash flow or purchases of securities, could be negative in some years.

1. Is there a dispute about mitigation?

Normally, the actual earnings of the plaintiff before trial are not an important source of disagreement. Sometimes, however, the defendant will argue that the plaintiff has failed to meet its duty to mitigate. The defendant will propose that the proper offset is the earnings the plaintiff should have achieved, under proper *mitigation*, rather than actual earnings. In some cases the defendant may presume the ability of the plaintiff to mitigate in certain ways unless the defendant has specific knowledge otherwise at the time of a breach. For example, unless the defendant could reasonably foresee otherwise, the defendant may presume that the plaintiff could mitigate by locating another source of supply in the event of a breach of a supply agreement. Damages are limited to the difference between the contract price and the current market price in that situation.

For personal injuries, the issue of mitigation often arises because the defendant believes that the plaintiff's failure to work after the injury is a withdrawal from the labor force or retirement rather than the result of the injury. For commercial torts, mitigation issues can be more subtle. Where the plaintiff believes that the harmful act destroyed a company, the defendant may argue that the company could have been put back together and earned profit, possibly in a different line of business. The defendant will then treat the hypothetical profits as an offset to damages.

Alternatively, where the plaintiff continues to operate the business after the harmful act, and includes subsequent losses in damages, the defendant may argue that the proper mitigation was to shut down after the harmful act.

Example: Franchisee Soil Tester starts up a business based on Franchisor's proprietary technology, which Franchisor represents as meeting government standards. During the start-up phase, Franchisor notifies Soil Tester that the technology has failed. Soil Tester continues to develop the business but

sues Franchisor for profits it would have made from successful technology. Franchisor calculates much lower damages on the theory that Soil Tester should have mitigated by terminating start-up.

Comment: This is primarily a factual dispute about mitigation. Presumably Soil Tester believes it has a good case, that it was appropriate to continue to develop the business despite notification of the failure of the technology.

Disagreements about mitigation may be hidden within the frameworks of the plaintiff's and the defendant's damages studies.

Example: Defendant Board Maker has been found to have breached an agreement to supply circuit boards. Plaintiff Computer Maker's damages study is based on the loss of profits on the computers to be made from the circuit boards. Board Maker's damages study is based on the difference between the contract price for the boards and the market price at the time of the breach.

Comment: There is an implicit disagreement about Computer Maker's duty to mitigate by locating alternative sources for the boards not supplied by the defendant. The Uniform Commercial Code spells out the principles for resolving these legal issues under the contracts it governs.

C. Prejudgment Interest

1. Do the parties agree about how to calculate prejudgment interest?

The law may specify how to calculate interest for past losses (*prejudgment interest*). State law may exclude prejudgment interest, limit prejudgment interest to a statutory rate, or exclude compounding. Table 1 illustrates these alternatives. With simple un compounded interest, losses from five years before trial earn five times the specified interest, so compensation for a \$100 loss from five years ago is exactly \$135 at 7% interest. With *compound interest*, the plaintiff earns interest on past interest. Compensation is about \$140 for a loss of \$100 five years before trial. The difference between simple and compound interest becomes much larger if the time from loss to trial is greater or if the interest rate is higher. Because, in practice, interest receipts do earn further interest, economic analysis would generally support the use of compound interest.

Table 1
Calculation of Prejudgment Interest (In Dollars)

Years Before Trial	Loss Without Interest	Loss with Compound Interest at 7%	Loss with Simple Uncompounded Interest at 7%
10	100	197	170
9	100	184	163
8	100	172	156
7	100	161	149
6	100	150	142
5	100	140	135
4	100	131	128
3	100	123	121
2	100	114	114
1	100	107	107
0	100	100	100
Total	1,100	1,578	1,485

Where the law does not prescribe the form of interest for past losses, the experts will normally apply a reasonable interest rate to bring those losses forward. The parties may disagree on whether the interest rate should be measured before or after tax. The before-tax interest rate is the normally quoted rate. To calculate the corresponding after-tax rate, one subtracts the amount of income tax the recipient would have to pay on the interest. Thus, the after-tax rate depends on the tax situation of the recipient, who is the plaintiff in the context of damages. The format for calculation of the after-tax interest rate is shown in the following example:

(1) Interest rate before tax:	9%
(2) Tax rate:	30%
(3) Tax on interest (line (1) times line (2)):	2.7%
(4) After-tax interest rate (line (1) less line (3)):	6.3%

Even where damages are calculated on a pretax basis, economic considerations suggest that the prejudgment interest rate should be on an after-tax basis: Had the plaintiff actually received the lost earnings in the past and invested the earnings at the assumed rate, income tax would have been due on the interest.

The plaintiff's accumulated value would be the amount calculated by compounding past losses at the after-tax interest rate.

Where there is economic disparity between the parties, there may be a disagreement about whose interest rate should be used—the borrowing rate of the defendant or the lending rate of the plaintiff, or some other rate. There may also be disagreements about adjustment for risk.⁷

Example: Farmer receives insurance payment one year late from Crop Insurer. Farmer calculates damages as the large amount of interest charged by a personal finance company; no bank was willing to lend to him, given his precarious financial condition. Crop Insurer calculates damages as the interest on the late payment at the normal bank loan rate.

Comment: The law may limit claims for prejudgment interest, and a court may hold that this situation falls within the limit. Economic analysis does support the idea that delays in payments are more costly to people with higher borrowing rates.

D. Projections of Future Earnings

1. Is there disagreement about the projection of profitability but for the harmful event?

A common source of disagreement about the likely profitability of a business is the absence of a track record of earlier profitability. Whenever the plaintiff is a start-up business, the issue will arise of reconstructing the value of a business with no historical benchmark.

Example: Plaintiff Xterm is a failed start-up. Defendant VenFund has been found to have breached a venture-capital financing agreement. Xterm's damages study projects the profits it would have made under its business plan. VenFund's damages estimate, much lower, is based on the value of the start-up revealed by sales of Xterm equity made just before the breach.

Comment: Both sides confront factual issues to validate their damages estimates. Xterm needs to show that its business plan was still a reasonable forecast as of the time of the breach. VenFund needs to show that the sale of equity places a reasonable value on the firm; that is, that the equity sale was at arms' length and was not subject to discounts.

⁷ See generally James M. Patell et al., *Accumulating Damages in Litigation: The Roles of Uncertainty and Interest Rates*, 11 J. Legal Stud. 341 (1982) (extensive discussion of interest rates in damages calculations).

2. Is there disagreement about the plaintiff's actual earnings after the harmful event?

When the plaintiff has mitigated the adverse effects of the harmful act by making an investment that has not yet paid off at the time of trial, disagreement may arise about the value that the plaintiff has actually achieved.

Example: Manufacturer breaches agreement with Distributor. Distributor starts a new business that shows no accounting profit as of the time of trial. Distributor's damages study makes no deduction for actual earnings during the period from breach to trial. Manufacturer's damages study places a value on the new business as of the time of trial and deducts that value from damages.

Comment: Some offset for economic value created by Distributor's mitigation efforts may be appropriate. Note that if Distributor made a good-faith effort to create a new business, but was unsuccessful because of adverse events outside its control, the issue of the treatment of unexpected subsequent events will arise. (See section III.F.1)

3. Do the parties use constant dollars for future losses, or is there escalation for inflation?

Persistent inflation in the U.S. economy complicates projections of future losses. Although inflation rates in the 1990s have been only in the range of 3% per year, the cumulative effect of inflation has a pronounced effect on future dollar quantities. At 3% annual inflation, a dollar today buys what \$4.38 will buy fifty years from now. Under inflation, the unit of measurement of economic values becomes smaller each year, and this shrinkage must be considered if future losses are measured in the smaller dollars of the future. We refer to the calculations of this process as embodying *escalation*. Dollar losses grow into the future because of the use of the shrinking unit of measurement. For example, an expert might project that revenues will rise at 5% per year for the next ten years—3% because of general inflation and 2% more because of the growth of a firm.

Alternatively, the expert may project future losses in *constant dollars* without escalation for future inflation. The use of constant dollars avoids the problems of dealing with a shrinking unit of measurement and often results in more intuitive damages calculations. In the example just given, the expert might project that revenues will rise at 2% per year in constant dollars. Constant dollars must be stated with respect to a base year. Thus a calculation in constant 1995 dollars means that the unit for future measurement is the purchasing power of the dollar in 1995.

E. Discounting Future Losses

For future losses, a damages study calculates the amount of compensation needed at the time of trial to replace expected future lost income. The result is discounted future losses; it is also sometimes referred to as the present discounted value of the future losses. Discounting is conceptually separate from the adjustment for inflation considered in the previous section. Discounting is typically carried out in the format shown in Table 2.

Table 2
Calculation of Discounted Loss at 5% Interest

Years in Future	Loss	Discount Factor	Discounted Loss ^a
0	\$100.00	1.000	\$100.00
1	125.00	0.952	119.00
2	130.00	0.907	118.00
Total			\$337.00

^a"Discounted Loss" equals "Loss" times "Discount Factor."

"Loss" is the estimated future loss, in either escalated or constant-dollar form. "Discount Factor" is a factor that calculates the number of dollars needed at the time of trial to compensate for a lost dollar in the future year. The discount factor is calculated by applying compound interest forward from the base year to the future year, and then taking the reciprocal. For example, in Table 2, the interest rate is 5%. The discount factor for the next year is calculated as the reciprocal of 1.05. The discount factor for two years in the future is calculated as the reciprocal of 1.05 times 1.05. Future discounts would be obtained by multiplying by 1.05 a suitably larger number of times and then taking the reciprocal. The discounted loss is the loss multiplied by the discount factor for that year. The number of dollars at time of trial that compensates for the loss is the sum of the discounted losses, \$337 in this example.

The interest rate used in discounting future losses is often called the *discount rate*.

1. Are the parties using a discount rate properly matched to the projection in constant dollars or escalated terms?

To discount a future loss projected in escalated terms, one should use an ordinary interest rate. For example, in Table 2, if the losses of \$125 and \$130 are in dollars of those years, and not in constant dollars of the initial year, then the use

of a 5% discount rate is appropriate if 5% represents an accurate measure of the time value of money.

To discount a future loss projected in constant dollars, one should use a *real interest rate* as the discount rate. A real interest rate is an ordinary interest rate less an assumed rate of future inflation. The deduction of the inflation rate from the discount rate is the counterpart of the omission of escalation for inflation from the projection of future losses. In Table 2, the use of a 5% discount rate for discounting constant-dollar losses would be appropriate if the ordinary interest rate was 8% and the rate of inflation was 3%. Then the real interest rate would be 8% minus 3%, or 5%.

The ordinary interest rate is often called the *nominal interest rate* to distinguish it from the real interest rate.

2. Is one of the parties assuming that discounting and earnings growth offset each other?

An expert might make the assumption that future growth of losses will occur at the same rate as the appropriate discount rate. Table 3 illustrates the standard format for this method of calculating discounted loss.

Table 3
Calculation of Discounted Loss When Growth and Discounting Offset Each Other

Years in Future	Loss	Discount Factor	Discounted Loss ^a
0	\$100.00	1.000	\$100.00
1	105.00	0.952	100.00
2	110.30	0.907	100.00
Total			\$300.00

^a"Discounted Loss" equals "Loss" times "Discount Factor."

When growth and discounting exactly offset each other, the present discounted value is the number of years of lost future earnings multiplied by the current amount of lost earnings.⁸ In Table 3, the loss of \$300 is exactly three times the base year's loss of \$100. Thus the discounted value of future losses can be calculated by a shortcut in this special case. The explicit projection of future losses and the discounting back to the time of trial are unnecessary. However, the par-

8. Certain state courts have, in the past, required that the offset rule be used so as to avoid speculation about future earnings growth. In *Beaulieu v. Elliott*, 434 P.2d 665, 671-72 (Alaska 1967), the court ruled that discounting was exactly offset by wage growth. In *Kaczowski v. Bolubasz*, 421 A.2d 1027, 1036-38 (Pa. 1980), the Pennsylvania Supreme Court ruled that no evidence on price inflation was to be introduced and deemed that inflation was exactly offset by discounting.

ties may dispute whether the assumption that growth and discounting are exactly offsetting is realistic in view of projected rates of growth of losses and market interest rates at the time of trial.

In *Jones & Laughlin Steel Corp. v. Pfeifer*,⁹ the Supreme Court considered the issue of escalated dollars with nominal discounting against constant dollars with real discounting. It found both acceptable, though the Court seemed to express a preference for the second format. In general, the Court appeared to favor discount rates in the range of 1% to 3% per year in excess of the growth of earnings.

3. Is there disagreement about the interest rate used to discount future lost value?

Discount calculations should use a reasonable interest rate drawn from current data at the time of trial. The interest rate might be obtained from the rates that could be earned in the bond market from a bond of maturity comparable to the lost stream of receipts. As in the case of prejudgment interest, there is an issue as to whether the interest rate should be on a before- or after-tax basis. The parties may also disagree about adjusting the interest rate for risk. A common approach for determining lost business profit is to use the Capital Asset Pricing Model (CAPM) to calculate the risk-adjusted discount rate. The CAPM is the standard method in financial economics to analyze the relation between risk and discounting. In the CAPM method, the expert first measures the firm's "beta"—the amount of variation in one firm's value per percentage point of variation in the value of all businesses. Then the risk-adjusted discount rate is the risk-free rate from a U.S. Treasury security plus the beta multiplied by the historical average risk premium for the stock market.¹⁰ For example, the calculation may be presented in the following format:

(1) Risk-free interest rate:	4.0%
(2) Beta for this firm:	1.2%
(3) Market equity premium:	8.0%
(4) Equity premium for this firm ((2) times (3)):	9.6%
(5) Discount rate for this firm ((1) plus (4)):	13.6%

4. Is one of the parties using a capitalization factor?

Another approach to discounting a stream of losses uses a market *capitalization factor*. A capitalization factor is the ratio of the value of a stream of continuing income to the current amount of the stream; for example, if a firm is worth \$1 million and its current earnings are \$100,000, its capitalization factor is ten.

9. 462 U.S. 523 (1983).

10. Richard A. Brealey & Stewart C. Myers, *Principles of Corporate Finance* 181–212 (4th ed. 1991).

The capitalization factor is generally obtained from the market values of comparable assets or businesses. For example, the expert might locate a comparable business traded in the stock market and compute the capitalization factor as the ratio of stock market value to operating income. In addition to capitalization factors derived from markets, experts sometimes use rule-of-thumb capitalization factors. For example, the value of a dental practice might be taken as one year's gross revenue (the capitalization factor for revenue is one). Often the parties dispute whether there is reliable evidence that the capitalization factor accurately measures value for the specific asset or business.

Once the capitalization factor is determined, the calculation of the discounted value of the loss is straightforward: It is the current annual loss in operating profit multiplied by the capitalization factor. A capitalization-factor approach to valuing future losses may be formatted in the following way:

(1) Ratio of market value to current annual earnings in comparable publicly traded firms:	13
(2) Plaintiff's lost earnings over past year:	\$200
(3) Value of future lost earnings ((1) times (2)):	\$2,600

The capitalization-factor approach might also be applied to revenue, cash flow, accounting profit, or other measures. The expert might adjust market values for any differences between the valuation principles relevant for damages and those that the market applies. For example, the value in the stock market may be considered the value placed on a business for a noncontrolling interest, whereas the plaintiff's loss relates to a controlling interest. The parties may dispute almost every element of the capitalization calculation.

Example: Lender is responsible for failure of Auto Dealer. Plaintiff Auto Dealer's damages study projects rapid growth of future profits but for Lender's misconduct. The study uses a discount rate calculated as the after-tax interest rate on Treasury bills. The resulting estimate of lost value is \$10 million. Defendant Lender's damages study uses data on the actual sale prices of similar dealerships in various parts of the country. The data show that the typical sales price of a dealership is six times its annual pretax profit. Lender's damages study multiplies the capitalization factor of six by the most recent annual pretax profit of Auto Dealer of \$500,000 to estimate lost value as \$3 million.

Comment: Part of the difference comes from the lower effective discount rate used by Auto Dealer. Another reason may be that the \$500,000 pretax profit may understate profit in the typical future year.

5. Is one party using the appraisal approach to valuation and the other the discounted-income approach?

The *appraisal* approach places a value on a stream of earnings by determining the value of a similar stream in a market for such earnings streams. For example, to place a value on the stream of earnings from a rental property, the appraisal approach would look at the market values of similar properties. The appraisal approach is suitable for many kinds of real property and some kinds of businesses.

Example: Oil Company deprives Gas Station Operator of the benefits of Operator's business. Operator's damages study projects future profits and discounts them to the time of trial, to place a value of \$5 million on the lost business. Oil Company's damages study takes the average market prices of five nearby gas station businesses with comparable gasoline volume, to place a value of \$500,000 on the lost business.

Comment: This large a difference probably results from a fundamental difference in assumptions. Operator's damages study is probably assuming that profits are likely to grow, while Oil Company's damages study may be assuming that there is a high risk that the neighborhood will deteriorate and the business will shrink.

F. Other Issues Arising in General in Damages Measurement

1. Is there disagreement about the role of subsequent unexpected events?

Random events occurring after the harmful event can affect the plaintiff's actual loss. The effect might be either to amplify the economic loss from what might have been expected at the time of the harmful event or to reduce the loss.

Example: Housepainter uses faulty paint, which begins to peel a month after the paint job. Owner measures damages as the cost of repainting. Painter disputes on the grounds that a hurricane that actually occurred three months after the paint job would have ruined a proper paint job anyway.

Comment: This dispute will need to be resolved on legal rather than economic grounds. Both sides can argue that their approach to damages will, on the average over many applications, result in the right incentives for proper house painting.¹¹

11. See Franklin M. Fisher & R. Craig Romaine, *Janis Joplin's Yearbook and the Theory of Damages*, in *Industrial Organization, Economics, and the Law* 392, 399-402 (John Monz ed., 1991).

The issue of subsequent random events should be distinguished from the legal principle of supervening events. The subsequent events occur after the harmful act; there is no ambiguity about who caused the damage, only an issue of quantification of damages. Under the theory of a supervening event, there is precisely a dispute about who caused an injury. In the example above, there would be an issue of the role of a supervening event if the paint did not begin to peel until *after* the hurricane.

Disagreements about the role of subsequent random events are particularly likely when the harmful event is fraud.

Example: Seller of property misstates condition of property. Buyer shows that he would not have purchased the property absent the misstatement. Property values in general decline sharply between the fraud and the trial. Buyer measures damages as the difference between the market value of the property at the time of trial and the purchase price. Seller measures damages as the difference between the purchase price and the market value at the time of purchase, assuming full disclosure.

Comment: Buyer may be able to argue that retaining the property was the reasonable course of action after uncovering the fraud; in other words, there may be no issue of mitigation here. In that sense, Seller's fraud caused not only an immediate loss, as measured by Seller's damages analysis, but also a subsequent loss. Seller, however, did not cause the decline in property values. The dispute needs to be resolved as a matter of law.

2. How should damages be apportioned among the various stakeholders?

Usually the plaintiff need not distinguish between the defendant and the beneficiaries of the wrongdoing. In some cases, the law unambiguously determines who should pay for losses. For example, if a corporation increases its own profit through an antitrust violation, the defendant is the corporation and the shareholders are the recipients of the illegal profits. In general, the corporation is sued and current shareholder profits are reduced by the amount of the damages award. A current shareholder who may have purchased shares after the wrongdoing ceased will pay for the plaintiff's injury even though the shareholder did not share in the illegal profits. The shareholder's only recourse is to sue the firm and its officers.

A related issue can arise when a public utility is sued.

Example: Electric Utility infringes a patent. Patent Owner seeks compensation for lost royalties. Utility argues that the royalty

would have been part of its rate base, and it would have been allowed higher prices so as to achieve its allowed rate of return had it paid a royalty. It, therefore, did not profit from its infringement. Instead, the ratepayers benefited. Patent Owner argues that Utility stands in for all stakeholders.

Comment: In addition to the legal issue of whether Utility does stand in for ratepayers, there are two factual issues: Would a royalty actually have been passed on to ratepayers? Will the award be passed on to ratepayers?

Similar issues can arise in employment law.

Example: Plaintiff Sales Representative sues for wrongful denial of a commission. Sales Representative has subcontracted with another individual to do the actual selling and pays a portion of any commission to that individual as compensation. The subcontractor is not a party to the suit. Defendant Manufacturer argues that damages should be Sales Representative's lost profit measured as the commission less costs, including the payout to the subcontractor. Sales Representative argues that she is entitled to the entire commission.

Comment: Given that the subcontractor is not a plaintiff, and Sales Representative avoided the subcontractor's commission, the literal application of standard damages-measurement principles would appear to call for the lost-profit measure. The subcontractor, however, may be able to claim its share of the damages award. In that case, restitution would call for damages equal to the entire lost commission, so that, after paying off the subcontractor, Sales Representative receives exactly what she would have received absent the breach. Note that the second approach would place the subcontractor in exactly the same position as the Internal Revenue Service in our discussion of adjustments for taxes in section III.A.5.¹²

12. This example provoked vehement reactions from our reviewers. All believed the resolution was obvious, but some thought the plaintiff should receive only its anticipated profit, and others thought the plaintiff should receive the entire commission.

...

IV. Subject Areas of Economic Loss Measurement

A. Personal Lost Earnings

A claim for loss of personal earnings occurs as the result of wrongful termination, discrimination, injury, or death. The earnings usually come from employment, but essentially the same issues arise if self-employment or partnership earnings are lost. Most damages studies for personal lost earnings fit the paradigm of Figure 1 quite closely.

1. Is there a dispute about projected earnings but for the harmful event?

The plaintiff seeking compensation for lost earnings will normally include wages or salary; other cash compensation, such as commissions, overtime, and bonuses; and the value of fringe benefits. Disputes about wages and salary before trial are the least likely, especially if there are employees in similar jobs whose earnings were not interrupted. Even so, the plaintiff may make the case that a promotion would have occurred after the time of the termination or injury. The more variable elements of cash compensation are more likely to be in dispute. One side may measure bonuses and overtime during a period when these parts of compensation were unusually high, and the other side may choose a longer period, during which the average is lower.

2. What benefits are part of damages?

Loss of benefits may be an important part of lost personal earnings damages. A frequent source of dispute is the proper measurement of vacation and sick pay. Here the strict adherence to the format of Figure 1 can help resolve these disputes. Vacation and sick pay is part of the earnings the plaintiff would have received but for the harmful event. It would be double counting to include vacation and sick pay in benefits when it has already been included in cash earnings.

The valuation of fringe benefits is frequently a source of important disputes. When benefits take a form other than immediate cash, there are two basic approaches to valuation: (1) the cost to the employer, and (2) the value to the worker. Disputes may arise because of differences between these two approaches or in the application of either one.

Example: Employee is terminated in breach of an employment agreement. Employee's damages analysis includes the value of Employee's coverage under Employer's company medical plan, estimated by the cost of obtaining similar coverage as an individual. Employee's damages analysis also includes Employer's contribution to Social Security. Employer's opposing study values the medical benefits at the cost of the company plan, which is much less than an individual plan. Employer places a value of zero on Social Security contributions, on the grounds that the Social Security benefit formula would give the same benefits to Employee whether or not the additional employer contributions had been made.

Comment: Although the valuation of benefits from Employer's point of view has theoretical merit, the obstacles are obvious from these two examples. On the value of the medical benefits, if Employee actually has purchased equivalent coverage as an individual, there is a case for using that cost. The valuation of prospective Social Security benefits is forbiddingly complex, and most experts settle for measuring the value as the employer's contribution.

3. Is there a dispute about mitigation?

Actual earnings before trial, although known, may be subject to dispute if the defendant argues that the plaintiff took too long to find a job or the job taken was not sufficiently remunerative. Even more problematic may be the situation where the plaintiff continues to be unemployed.

Parties disputing the length of a job search frequently offer testimony from job placement experts. Testimony from a psychologist also may be offered if the plaintiff has suffered emotional trauma as a result of the defendant's actions. Recovery from temporarily disabling injuries may be the subject of testimony by experts in vocational rehabilitation. Also, data about displaced workers, which can be obtained from the U.S. Bureau of Labor Statistics, provide information about how long others have taken to find jobs.

The defendant may argue that the plaintiff—for reason of illness, injury, or vacation, not related to the liability issues in the case—has chosen not to undertake a serious job search and therefore failed to meet the duty to mitigate. A damages study based on that conclusion will impute earnings to replace the actual earnings (if any) in the box labeled "Actual earnings before trial" in Figure 1.

Example: Plumber loses two years of work as a result of slipping on ice. His damages claim is for two years of earnings as a plumber. Defendant Hotel Owner calculates damages as the difference between those earnings and one year of earnings as a bartender, on the grounds that Plumber was capable of working as a bartender during the second year of his recovery.

Comment: Employment law may limit the type of alternative job that the plaintiff is obligated to consider.

Resolution of the mitigation issue can also be complicated if the plaintiff has taken a less remunerative job in anticipation of subsequent increases. For example, the plaintiff may have gone back to school to qualify for a better-paying job in the future. Or, the plaintiff may have taken a lower-paying job in which the career path offers more advancement. A common occurrence, particularly for more experienced workers with the appropriate skills, is to become a self-employed businessperson. The problem becomes how to value the plaintiff's activities during the development period of the business. On the one hand, the plaintiff may have made a reasonable choice of mitigating action by starting a business. On the other hand, the defendant is entitled to an offset to damages for the value of the plaintiff's investment in the development of the business.

When damages are computed over the entire remaining work life of the plaintiff, the timing of earnings on the mitigation side is less critical. The economic criterion for judging the adequacy of mitigation is that the present value of the stream of earnings over the plaintiff's work life in the chosen career exceeds the present value of the stream of earnings from alternative careers. In other words, it is appropriate that the defendant should be charged with replacing the entire amount of but-for earnings during a period of schooling or other investment if the defendant is being relieved of even more responsibility in future years as the investment pays off. If, however, the plaintiff appears to have chosen a lower-paying career for noneconomic reasons, then the defendant may argue that the amounts corresponding to the boxes labeled "Actual earnings before trial" and "Projected earnings after trial" in Figure 1 should be based on the plaintiff's highest-paying alternative. The defendant also may argue along these lines if damages are computed over a period shorter than the plaintiff's work life.

4. Is there disagreement about how the plaintiff's career path should be projected?

The issues that arise in projecting but-for and actual earnings after trial are similar to the issues that arise in measuring damages before trial. In addition, the parties are likely to disagree regarding the plaintiff's future increases in compensation. A damages analysis should be internally consistent. For example, the com-

pensation path for both but-for and actual earnings paths should be based on consistent assumptions about general economic conditions, about conditions in the local labor market for the plaintiff's type of work, and about the plaintiff's likely increases in skills and earning capacity. The analysis probably should project a less successful career on the mitigation side if it is projecting a slow earnings growth absent the harm. Similarly, if the plaintiff is projected as president of the company in ten years absent the harm, the study should probably project similar success in the mitigating career.

Example: Executive suffers wrongful termination. His damages study projects rapid growth in salary, bonus, and options, thanks to a series of likely promotions had he not been terminated. After termination, he looked for work unsuccessfully for a year and then started up a consulting business. Earnings from the consulting business rise, but never reach the level of his projected compensation but for the termination. Damages are estimated at \$3.6 million. His former employer's opposing damages study is based on the hypothesis that he would have been able to find a similar job within nine months if he had searched diligently. Damages are estimated at \$275,000.

Comment: This example illustrates the type of factual disputes that are typical of executive termination damages. Note that there may be an issue of random subsequent events both in the duration of Executive's job search and in the success of his consulting business.

5. Is there disagreement about how earnings should be discounted to present value?

Because personal lost earnings damages may accrue over the remainder of a plaintiff's working life, the issues of predicting future inflation and discounting earnings to present value are particularly likely to generate quantitatively important disagreements. As we noted in section III.D, projections of future compensation can be done in constant dollars or escalated terms. In the first case, the interest rate used to discount future constant-dollar losses should be a real interest rate—the difference between the ordinary interest rate and the projected future rate of inflation. All else being the same, the two approaches will give identical calculations of damages. Under some conditions, future wage growth may be about equal to the interest rate, so that discounted future losses are the same in each future year. Damages after trial are then just the appropriate multiple of the current year's loss. Equivalently, the calculation can be done by projected future wage growth in escalating dollars and discounting by an ordinary interest

rate. Of course, the projected wage growth must be consistent with the expert's conclusion about inflation.

Substantial disagreements can arise about the rate of interest. Even when the parties agree that the interest rate should approximate what the plaintiff can actually earn by investing the award prudently, the parties may dispute the type of investment the plaintiff is likely to make. The plaintiff may argue that the real rate of interest should correspond to the real rate of interest for a money market fund, while the defendant may argue that the plaintiff would be expected to invest in instruments, such as the stock market, with higher expected returns. There may also be a disagreement about whether the discount rate should be calculated before or after taxes.

6. Is there disagreement about subsequent unexpected events?

Disagreements about subsequent unexpected events are likely in cases involving personal earnings, as we discussed in general in section III.F. For example, the plaintiff may have suffered a debilitating illness that would have compelled the resignation from a job even if the termination or injury had not occurred. Or the plaintiff would have been laid off as a result of employer hardship one year after the termination. The plaintiff might respond that the bad times were unexpected as of the time of the termination and so should be excluded from consideration in the calculation of damages.

7. Is there disagreement about retirement and mortality?

For damages after trial, there is another issue related to the issue of unexpected events before trial: How should future damages reflect the probability that the plaintiff will die or decide to retire? Sometimes an expert will assume a work-life expectancy and terminate damages at the end of that period. Tables of work-life expectancy incorporate the probability of both retirement and death. Another approach is to multiply each year's lost earnings by the probability that the plaintiff will be alive and working in that year. That probability declines gradually with age; it can be inferred from data on labor-force participation and mortality by age.

Within either approach, there may be disagreements about how much information to use about the individual. For example, if the plaintiff is known to smoke, should his survival rates be those of a smoker? Similarly, if the plaintiff is a woman executive, should her retirement probability be inferred from data on women in general, or would it be more reasonable to look at data on executives, who are mostly men?

B. Intellectual Property Damages

Intellectual property damages are calculated under federal law for patents, trademarks, and copyrights and under state law for trade secrets. Damages may be a combination of the value lost by the intellectual property owner and the value gained by the infringer, with adjustment to avoid double counting. The value lost by the intellectual property owner is lost profits, calculated as in other types of damages analysis. Under patent law, the lost profit includes a reasonable royalty the infringer should have paid the patent owner for the use of the patented invention. The reasonable royalty is generally defined as the amount the defendant would have paid the patent owner as the result of a license negotiation occurring at the time that the infringement began or the patent issued. Patent law does not provide for recovery of value gained by the infringer, except through the reasonable royalty. Under copyright law, the plaintiff is entitled to the revenue received by the infringer as a result of selling the copyrighted work, but the defendant is entitled to deduct the costs of reproducing the infringing work as an offset to damages (the plaintiff's damages case need not include the offset; the defendant typically raises this issue later). Under the Uniform Trade Secrets Law, the concept of value gained by the misappropriator is not limited to a particular formula.

1. Is there disagreement about what fraction of the defendant's sales would have gone to the plaintiff?

Patent law now makes it easier for a patent owner to argue that it would have received a share of the infringer's actual sale.¹³ Previously, the presence of a non-infringing product in the market required a lost-profit analysis to show, directly, which sales were lost. The damages analysis may now use some type of market-share model. The simplest model would consider the total market to have a given volume of sales, S . If the market shares of the plaintiff and the defendant are P and D , respectively, this model would predict that the plaintiff's market share, absent the defendant's sales, would be:

$$\frac{P}{1 - D}$$

This formula corresponds to the assumption that the defendant's sales would have been distributed evenly across the other sellers, including the plaintiff. Then the plaintiff's sales, absent the presence of the infringer in the market, would be:

$$\frac{P}{1 - D} S$$

¹³ *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 639 F. Supp. 937 (E.D. Tenn. 1986), *aff'd without op.*, 818 F.2d 875 (Fed. Cir.), *cert. denied*, 484 U.S. 845 (1987).

But this model is likely to be disputed. The issues are how large the market would have been, absent the defendant's infringing product, and what share of that market the plaintiff would have enjoyed. The defendant may argue that it enlarged the total market. Its product may appeal to customers who would not buy from any of the other sellers; for example, some of the infringing sales may be to affiliates of the infringer. With respect to the plaintiff's market share but for the infringement, the defendant may demonstrate that the rivals for the defendant's sales rarely included the plaintiff. Either the plaintiff or the defendant may argue that there are actually several different markets, each to be analyzed according to some type of market-share model.

2. Is there disagreement about the effect of infringement or misappropriation on prices as well as quantities (price erosion)?

The plaintiff may measure price erosion directly, by comparing prices before and after infringement, or indirectly, through an economic analysis of the market. The defendant may dispute direct measures of price erosion on the grounds that the drop in prices would have occurred despite the infringement as a result of normal trends or events occurring at the same time, unrelated to the infringement.

The parties may also dispute the relation between the size of the total market and prices. When a plaintiff's analysis projects that prices would have been higher absent infringement, the defendant may point out that higher prices would reduce the volume of total sales and thus reduce the plaintiff's sales. Disagreements about the measurement of lost profit are most likely to be resolved if both parties make their lost-profit calculations in the same format. The preferred format is:

$$\text{Lost profit} = [\text{price but for infringement}] \times [\text{quantity sold but for infringement}] \\ - [\text{actual revenue}] - [\text{extra cost of producing the extra quantity}]$$

This format avoids the danger of double counting that arises when the plaintiff makes separate claims for lost sales and price erosion.

3. Is there a dispute about whether the lost-profit calculation includes contributions from noninfringing features of the work or product (apportionment)?

Where the protected work or technology is not the only feature or selling point of the defendant's product, there may be disagreement about apportionment. One approach to quantitative apportionment of damages is to hypothesize that the defendant would have sold a different, noninfringing product containing the other features or selling points. The damages study then measures the plaintiff's

losses from the defendant's selling of the actual product rather than the alternative, hypothetical, noninfringing product.

Example: Camera Maker sells a camera that competes directly with Rival's similar camera. A court has determined that this is an infringement of Rival's autofocus patent. Rival's damages study hypothesizes the absence of Camera Maker's from the market. Camera Maker's damages study hypothesizes that it would have sold the same camera with a different, noninfringing autofocus system. Camera Maker has apportioned lost sales to take account of the other selling points of the camera, whereas Rival is considering all of the lost sales. Rival argues that its approach is correct because the camera would not have been put on the market absent the infringing autofocus system.

Comment: Note that the issue of apportionment here is, in essence, a special case of the more general issue discussed in section III.A, of disagreements about the alternative nonharmful conduct of the defendant. Here the alternative is what type of noninfringing product Camera Maker can hypothesize it would have sold absent infringement.¹⁴

4. Do the parties disagree about whether the defendant could have designed around the plaintiff's patent?

Under patent law, part of the plaintiff's lost profit from infringement is measured as the reasonable royalty the defendant would have paid for a license under the patent. The conceptual basis for the reasonable royalty is the outcome of a hypothetical negotiation occurring at the time the infringement began. Validity of the patent and the defendant's use of the protected technology are presumed in the hypothetical negotiation.

An important source of disagreement about the basis for the reasonable royalty and corresponding quantum of damages is the defendant's ability to design around the patent. A defendant may argue that any but a modest royalty would have caused it to reject the license and choose not to use the technology but to design around it instead.

¹⁴ In *Computer Assocs. Int'l v. Altai, Inc.*, 982 F.2d 693 (2d Cir. 1992), the appeals court determined that defendant could hypothesize that sales of its noninfringing earlier version of a software package would partially replace the actual sales of its infringing package, thus limiting the extra sales that plaintiff would have enjoyed absent the infringement.

5. Is there disagreement about how much of the defendant's advantage actually came from infringement (apportionment)?

Under patent law, apportionment is implicit in the reasonable-royalty framework; a defendant would not pay more for a patent license than its contribution to profit. Under copyright law, where damages include the defendant's gain measured as its revenue or profit, apportionment may be a major source of disagreement.

Example: Recording Company's compact disk contains one infringing song among twelve. Defendant's damages study is based on one-twelfth of the profit from the sales of the disk. Rock Composer argues that the infringing song is the main selling point of the disk and seeks all of defendant's profit.

Comment: This is a factual dispute. The parties may use survey evidence on consumers' reasons for purchasing the disk.

6. Is there disagreement about how to combine the plaintiff's loss and the defendant's gain in a way that avoids double counting?

The calculation normally involves calculation of the profit on the part of the defendant's sales not considered to be the plaintiff's lost sales. For example, if the defendant has sold 100 units and in the process has taken 60 units of sales away from the plaintiff, the damages would consist of the plaintiff's lost profits on the 60 units and the defendant's revenue or profit on the remaining 40 units that were incremental sales not taken from the plaintiff.

Disputes can arise about the elimination of double counting when the plaintiff and the defendant sell their products in different ways. For example, the plaintiff may bundle its product with related products, while the defendant sells a component to be bundled by others.

C. Antitrust Damages

Where the plaintiff is the customer of the defendant or purchases goods in a market where the defendant's antitrust misconduct has raised prices, damages are the amount of the overcharge. This amount may exceed the lost profit of the plaintiff, if it is a business, because the plaintiff may pass along part of the effect of the price increase to its own customers.¹⁵ Where the plaintiff is a rival of the defendant, injured by exclusionary or predatory conduct, damages are the lost profits from the antitrust misconduct.

¹⁵ *Hanover Shoe v. United Shoe Mach. Corp.*, 392 U.S. 481, 499 (1968) and *Illinois Brick Co. v. Illinois*, 431 U.S. 720 (1977) established the principle under the federal antitrust laws that, generally, a business plaintiff should not lower its damages claim on account of passing on overcharges to its customers, but rather the plaintiff should stand in for the downstream victims of overcharges.

1. Is there disagreement about the scope of the damages?

The plaintiff might calculate damages affecting all of its business activities, whereas the defendant might calculate damages only in markets where there is a likelihood of adverse impact from the defendant's conduct.

Example: Trucker's exclusionary conduct has monopolized certain routes, but only modestly raised its market share on many other nonmonopolized routes. Shippers seek damages for elevated prices in all affected markets, but Trucker's damages study considers only the routes where monopolization has occurred.

Comment : Here is a mixture of legal and economic issues. The law may set limits on the reach of antitrust damages even if economic analysis could quantify price elevation in all of the markets.

2. Is there a dispute about the causal link between the misconduct and the measured damages?

Experts face a particular challenge in making a complete analysis of the economic impact of antitrust misconduct on the relevant market. To overcome the analytical challenge, experts sometimes compare market conditions in a period affected by the misconduct with conditions in another period, during which the misconduct is known to be absent. The plaintiff might take the increase in price from the benchmark period to the affected period as a measure of the price elevation caused by the misconduct. The defendant may argue that the misconduct is not the only difference between the periods—prices rose, for example, because of cost increases or rising demand and not just because of a conspiracy or other misconduct.

Example: The price of plywood rises soon after a meeting of Plywood Producers. Plywood Purchasers attribute all of the price increase to a price-fixing conspiracy. Plywood Producers argue that increases in timber prices would have compelled increases in plywood prices even without a price-fixing agreement; their damages study attributes only part of the price increase to the conspiracy.

Comment: Economic analysis is capable, in principle, of inferring how much of a price increase is caused by a cost increase. Plywood Purchasers' damages analysis could be strengthened in this example by direct evidence on the amount of the price increase determined by the conspirators. In more sophisticated measurements of damages through comparisons of pe-

riods with and without the misconduct, experts may use regression analysis to adjust for influences other than the misconduct. Explanatory variables may include general economic indicators such as the national price level and Gross Domestic Product, and variables specific to the industry.¹⁶

3. Is there a dispute about how conditions would differ absent the challenged misconduct?

The plaintiff may calculate damages for exclusionary conduct on the basis that prices in the market would have been the same but for that conduct. The defendant may argue that the activities of the plaintiff and other firms, absent exclusion, would have driven prices down, and thus that the plaintiff has overstated the profit it lost from exclusion.

Example: Concert Promoter is the victim of exclusion by Incumbent through Incumbent's unlawful contracts with a ticket agency. Promoter's damages study hypothesizes that Promoter would be the only additional seller in the industry absent the contracts. Incumbent's damages study hypothesizes numerous additional sellers and price reductions sufficient to eliminate almost all profit. Incumbent's estimate of damages is a small fraction of Promoter's.

Comment: The elimination of one barrier to entry in the market—the unlawful contracts—will increase the profit available to potential rivals. On this account, some new rivals to the Concert Promoter might enter the market and share the benefits flowing from the elimination of the unlawful contracts. This is a limiting factor for Concert Promoter's damages. But there may be other barriers to the entry of rivals. For example, it may take an extended period for a new promoter to attract major performers. The plaintiff, already established in the business, might expect to make added profits from the elimination of the unlawful contracts, even though some new competitors would enter. See discussion of *Dolphin Tours* in section III.A.2.

When the harmful act is a tied sale, the issue of different conditions absent the harmful act is particularly critical. Tying arrangements are attempts by a business to extend its monopoly in one market into a related market. A pur-

16. See Daniel L. Rubinfeld, Reference Guide on Multiple Regression § II.B.3, in this manual.

chaser who wants the "tying" good must also purchase the "tied" good.¹⁷ The plaintiff, if a purchaser, may calculate damages as the price paid for the purchase of the tied product, on the theory that the purchase was unwanted and would not have occurred absent the tie. If the plaintiff is a rival in the market for the tied good, the plaintiff may calculate damages on the theory that it would have enjoyed higher sales absent the tie. In both cases, the defendant may respond that, absent the tie, the price for the tying good would have been higher and the price for the tied good would have been lower. Damages are then lower than those calculated by the purchaser plaintiff to the extent of the higher price for the tying good. Damages are lower than those calculated by the rival plaintiff because the lost sales would occur at a lower price.

Example: Dominant Film Seller has required that purchasers of film also buy processing. Film and processing Purchasers calculate damages on the theory that they could have bought film at the stated price from Dominant Seller but could have bought processing from a cheaper rival, absent the tie. Dominant Seller counters that it would have charged more for film absent the tie. In addition, Independent Processor calculates damages based on the theory that it would have picked up part of Dominant Seller's processing business and enabled it to charge the same price charged by Dominant Seller. Defendant Dominant Seller responds that it would have charged less for processing and more for film, absent the tie, so Independent Processor would be forced to charge a lower price.

Comment : When there is a strict tie between two products, the economist will be careful in interpreting the separate stated prices for the two products. In this example, all that matters to the customer is the combined price of film and processing. A full factual analysis is needed to restate pricing absent a tie. Eliminating a tie may stimulate entry into the market for the tied product (indeed, there was an upsurge of competition in the independent film processing market when tying was eliminated). Economists sometimes disagree why dominant firms use ties rather than simply extract all of the available monopoly profit from the product in which they are dominant.

¹⁷ For further explanation, see Stephen H. Knowlton et al., *Antitrust*, in *Litigation Services Handbook: The Role of the Accountant as Expert Witness* 208-09 (Peter B. Frank et al. eds., 1990).

D. Securities Damages

Where the harmful act takes the form of a failure to disclose adverse information about a firm whose securities are publicly traded, damages are typically sought by investors who bought the securities after the information should have been disclosed and before it was actually disclosed. Their losses are the excess value they paid for the securities, provided they did not sell before the adverse information affected the market. The damages study typically measures the excess price by the decline in the price that occurred when the information reached the market. Finance theory provides the framework generally used for this purpose.¹⁸ The effect of the adverse information on the price of the securities is the part of the total price change not predicted by finance theory, considering what happened in similar securities markets at the time the information affected the market.

1. Is there disagreement about when the adverse information affected the market?

The plaintiff might argue that the adverse information reached the market in a number of steps, and thus measure damages as the excess decline in value over a period including all of the steps. Defendant might reply that only one of those steps involved the actual disclosure, and measure damages as the excess decline only on the day of that disclosure. The length and timing of the "window" for measuring the excess decline is probably the most important source of disagreement in securities damages.

2. Is there disagreement about how to take proper account of turnover of the securities?

Frequently, securities damages must be measured before the victims are individually identified. The victims are those who purchased the securities after the time when a disclosure should have been made and still owned them when the disclosure was actually made. In order to estimate the volume of securities for which damages accrued, the pattern of turnover in ownership must be determined. Generally, data on total daily purchases of the securities will be available. These data provide an upper bound on the volume for damages. However, the actual volume will be lower because some of the securities will change hands more than once during the period between proper and actual disclosure. A detailed study of turnover patterns is needed for this purpose. The representatives of the plaintiff class might argue that few shares turned over more than once, while the defendant might reply that the observed transactions were largely the same shares turning over repeatedly.

¹⁸. See generally Brealey & Myers, *supra* note 10.

E. Liquidated Damages

1. Is there a dispute about the proper application of a provision for liquidated damages?

After parties have entered into a contract with liquidated damages, they may dispute whether the liquidated-damages provision actually should apply to a subsequent harmful event. The parties may disagree on whether the event falls within the class intended by the contract provision, or they may disagree on whether the liquidated damages bear a reasonable relation to actual damages, in the sense required by applicable law. In particular, the defendant may attack the amount of liquidated damages as a penalty that exaggerates the plaintiff's actual loss.

Changes in economic conditions may be an important source of disagreement about the reasonableness of a liquidated-damages provision. One party may seek to overturn a liquidated-damages provision on the grounds that new conditions make it unreasonable.

Example: Scrap Iron Supplier breaches supply agreement and pays liquidated damages. Buyer seeks to set aside the liquidated-damages provision because the price of scrap iron has risen, and the liquidated damages are a small fraction of actual damages under the expectations principle.

Comment: There may be conflict between the date for judging the reasonableness of a liquidated-damages provision and the date for measurement of expectations damages, as in this example. Generally, the date for evaluating the reasonableness of liquidated damages is the date the contract is made. In contrast, the date for expectations damages is the date of the breach. The result is a conundrum for which the economist needs guidance from the law. Enforcement of the liquidated-damages provision in this example will induce inefficient breach.

Appendix: Example of a Damages Study

Plaintiff SBM makes telephone switchboards. Defendant TPC is a telephone company. By denying SBM technical information and by informing SBM's potential customers that SBM's switchboards are incompatible with TPC's network, TPC has imposed economic losses on SBM. TPC's misconduct began in 1992. SBM's damages study presented at trial at the end of 1994 proceeds as follows (see Table 4):

1. Damages theory is compensation for lost profit from TPC's exclusionary conduct.
2. SBM would have sold more units and achieved a higher price per unit had SBM had access to complete technical information and had SBM not faced disparagement from TPC.
3. SBM would have earned profits before tax in 1992-94 in millions of dollars as shown in column 2 of Table 4, based on an analysis of lost business and avoided costs.
4. SBM's actual profits before tax are shown in column 3. Column 4 shows lost earnings. Column 5 shows the factor for the time value of money prescribed by law, with 7% annual simple interest without compounding. Column 6 shows the loss including prejudgment interest.
5. For the years 1995 through 1999, column 2 shows projected earnings but for TPC's misconduct.
6. For the same years, column 3 shows projected actual earnings.
7. Column 4 shows SBM's future earnings losses. Column 5 shows the discount factor based on a 4% annual after-tax interest rate, obtained by applying SBM's corporate tax rate to TPC's medium-term borrowing rate. TPC has an AA bond rating. Column 6 shows the discounted future loss. At the bottom of the table is the total loss of economic value, according to SBM's damages study, of \$1.237 billion.

Table 4
SBM's Damages Analysis (in Millions of Dollars)

(1) Year	(2) Earnings but for Misconduct	(3) Actual Earnings	(4) Loss	(5) Discount Factor	(6) Discounted Loss
1992	187	34	153	1.21	185
1993	200	56	144	1.14	164
1994	213	45	168	1.07	180
1995	227	87	140	1.00	140
1996	242	96	147	0.96	141
1997	259	105	153	0.92	142
1998	276	116	160	0.89	142
1999	294	127	167	0.85	143
Total					1,237

Table 5
TPC's Damages Analysis (in Millions of Dollars)

(1) Year	(2) Earnings but for Misconduct	(3) Earnings with Mitigation	(4) Loss	(5) Discount Factor	(6) Discounted Loss
1992	101	79	22	1.21	27
1993	108	85	23	1.14	26
1994	115	81	34	1.07	36
1995	123	98	25	1.00	25
1996	131	108	23	0.87	20
1997	140	119	21	0.76	16
1998	149	130	19	0.66	12
1999	159	143	16	0.57	9
Total					171

Defendant TPC presents an alternative damages study in the same format (see Table 5). TPC argues that SBM's earnings but for the misconduct, before and after trial, are the lower numbers shown in column 2 of Table 5. TPC believes that the number of units sold would be lower, the price would be lower, and costs of production higher, than in SBM's damages study. TPC further argues that SBM failed to mitigate the effects of TPC's misconduct—SBM could have obtained the technical information it needed from other sources, and SBM could have counteracted TPC's disparagement by vigorous marketing. Column 3 displays the earnings that TPC believes SBM could have achieved with proper mitigation. TPC argues that future losses should be discounted at a 14% rate determined from SBM's cost of equity and debt; SBM is a small, risky corporation with a high cost of funds. According to TPC's damages study, total lost value is only \$171 million.

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Glossary of Terms

Appraisal. A method of determining the value of the plaintiff's claim on an earnings stream by reference to the market values of comparable earnings streams. For example, if the plaintiff has been deprived of the use of a piece of property, the appraised value of the property might be used to determine damages.

Avoided Cost. Cost that the plaintiff did not incur as a result of the harmful act. Usually it is the cost that a business would have incurred in order to make the higher level of sales the business would have enjoyed but for the harmful act.

But-for Analysis. Restatement of the plaintiff's economic situation but for the defendant's harmful act. Damages are generally measured as but-for value less actual value received by the plaintiff.

Capitalization Factor. Factor used to convert a stream of revenue or profit into its capital or property value. A capitalization factor of 10 for profit means that a firm with \$1 million in annual profit is worth \$10 million.

Compound Interest. Interest calculation giving effect to interest earned on past interest. As a result of compound interest at rate r , it takes $(1+r)(1+r) = 1+2r+r^2$ dollars to make up for a lost dollar of earnings two years earlier.

Constant Dollars. Dollars adjusted for inflation. When calculations are done in constant 1995 dollars, it means that future dollar amounts are reduced in proportion to increases in the cost of living expected to occur after 1995.

Discount Rate. Rate of interest used to discount future losses.

Discounting. Calculation of today's equivalent to a future dollar, to reflect the time value of money. If the interest rate is r , the discount applicable to one year in the future is:

$$\frac{1}{1+r}$$

Discounts for multiple years are the products of one-year discounts, to achieve compounding.

Earnings. Economic value received by the plaintiff. Earnings could be salary and benefits from a job, profit from a business, royalties from licensing intellectual property, or the proceeds from a one-time or recurring sale of property. Earnings are measured net of costs. Thus, lost earnings are lost receipts less costs avoided.

Escalation. Consideration of future inflation in projecting earnings or other dollar flows. The alternative is to make projections in constant dollars.

Expectations Damages. Damages measured on the principle that the plaintiff is entitled to the benefit of the bargain originally made with the defendant.

Fixed Cost. Cost that would not have risen if a business had enjoyed higher sales.

Mitigation. Action taken by the plaintiff to minimize the economic effect of the harmful act. Also often refers to the actual level of earnings achieved by the plaintiff after the harmful act.

Nominal Interest Rate. Interest rate quoted in ordinary dollars, without adjustment for inflation. Interest rates quoted in markets and reported in the financial press are always nominal interest rates.

Prejudgment Interest. Interest on losses occurring before trial.

Present Value. Value today of money due in the past (with interest) or in the future (with discounting).

Price Erosion. Effect of the harmful act on the price charged by the plaintiff. When the harmful act is wrongful competition, as in intellectual property infringement, price erosion is one of the ways that the plaintiff's earnings have been harmed.

Real Interest Rate. Interest rate adjusted for inflation. The real interest rate is the nominal interest rate less the annual rate of inflation.

Regression Analysis. Statistical technique for inferring stable relationships among quantities. For example, regression analysis may be used to determine how costs typically rise when sales rise.

Reliance Damages. Damages measured on the principle that the transaction or relationship should not have existed in the first place but was brought into being by the harmful act.

Restitution Damages. Damages measured on the principle of restoring the economic equivalent of lost property or value.

Variable Cost. Component of a business's cost that would have been higher if the business had enjoyed higher sales. See also Avoided Cost.

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